Geophysical Research Abstracts
Vol. 16, EGU2014-13429, 2014
EGU General Assembly 2014


# Hydrochemical features of groundwater in a coastal gypsum karst (Marina di Lesina, Gargano, Southern Italy) in relation to tides

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As part of a complex monitoring aimed at collecting suitable data for conceptual and numerical modelling of the coastal gypsum karst of Marina di Lesina (Gargano, Southern Italy), 64 groundwater samples were collected during three surveys at different depths from 9 monitoring wells aligned along two transects. The transects, perpendicular to the Acquarotta canal, are less of 1 Km long. The canal is directly connected to the sea and to the Lesina Lagoon and behaves as an oscillating border following sea tides. The sampling campaigns were carried out concurrently to phases of increasing, decreasing, and low tide and provide different frameworks of the chemical composition of ground waters. TDS (Total Dissolved Solids) of ground water samples ranges from 0.2 g/l to 35 g/l and increases generally along the flow lines towards the canal, and downward. The concentrations of the major ions deviate from theoretical ones defined by non-reactive mixing lines, which have as saline end-member either standard seawater or local seawater sampled offshore.Owing to the multi-component character of the hydrochemical system, the cation concentrations are controlled by competition among concurrent water–rock interaction processes that overlap to non-reactive freshwater-saltwater (FW-SW) mixing, being even triggered and/or enhanced by the same mixing, with feedback loops: gypsum and calcite dissolution, ion exchange (with direction depending on hydrodynamic conditions mainly driven by tides, and justified due to the presence of clay in the gypsum bedrock), and dedolomitization. The geochemical study also highlights the involvement of saline ground waters belonging to regional circuits that develop in the huge Mesozoic carbonate basement. The study highlights that in the saturated thickness of the gypsum coastal aquifer closer to the coast, the hydrochemical system is extremely reactive and strongly influenced by the different groundwater hydraulic conditions induced by the tide phases.